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ILLINOIS LANDOWNER'S GUIDE TO AMPHIBIAN CONSERVATION

R.E. Szafoni

C.A. Phillips

S.R. Ballard

R.A. Brandon

G. Kruse

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Contents

HOW TO USE THIS GUIDE

The purpose of this guide is twofold. First, the guide provides a brief overview of the amphibians of Illinois, including aspects of their life histories and distributions. This background information is important in helping you assess an area and determine appropriate habitat enhancement and management practices. In particular, it is useful to become familiar with the amphibians that may be present in your part of the state (see Fig. 1, Tables 3 and 4). This information can help focus management efforts on local species.

In the second part of the guide, we provide technical guidance to resource managers, planners, restorationists, and private landowners in Illinois who wish to create, enhance, and manage habitat for amphibians. Regardless of the habitats available on your land, the management guidelines can make your area more suitable for amphibians.

For individuals familiar with Illinois amphibians, skipping to the second part of the guide will get you started on planning a land management strategy to benefit amphibians. However, for those less familiar with amphibians as well as those with some knowledge, we recommend developing an understanding of the diversity and complexity of amphibian life histories that will provide valuable background information from which you can evaluate your land and make amphibian conservation a reality.

INTRODUCTION

What Are Amphibians?

Amphibians are the group of animals that includes frogs, toads, and salamanders (Tables 1 and 2). As adults, most live in habitats ranging from permanent bodies of water to moist places on land. Toads can live in relatively dry habitats.

The skin of amphibians is scaleless, soft to the touch, and covered with mucus. The moist body surface allows amphibians to breathe through their skin. Aquatic larval stages have external gills and a few totally aquatic amphibians, such as the mudpuppy and lesser siren, keep gills throughout life. The salamanders of the family Plethodontidae lack lungs entirely and obtain oxygen primarily through their skin.

Various glands in the amphibian skin serve different functions including keeping it moist and reducing drying, sex recognition, coordination of courtship behavior, and discouraging potential predators. For example, large glandular clusters on the heads of toads produce powerful toxins that discourage predators from eating them.

Most amphibians are secretive or nocturnal and some spend part of the year underground in burrows. Surface activity is regulated by moisture. Some species, such as the ambystomatid salamanders, eastern narrowmouth toad, Illinois chorus frog, and crawfish frog, spend the majority of their existence underground, emerging only to migrate to a breeding pond in the spring or autumn. Salamanders of the genus *Plethodon* are mainly subterranean but emerge at night to feed.

BASIC BIOLOGY

Life History

It is difficult to generalize about the breeding habits of amphibians because they are marvelously diverse. For many species, reproduction requires rainfall and relatively cool temperatures. Most breed in late winter and spring, while a few species, such as the bullfrog and green treefrog, reproduce during the summer. The marbled salamander reproduces in autumn. Adults of many species migrate 500 feet or more to traditional breeding ponds, such as temporary pools and wetlands, where they lay their eggs. The spring calling of frogs is a sure sign that winter is waning.

Male frogs and toads vocalize to attract females to an aquatic breeding site. Male frogs and toads grasp the female in a hold called amplexus and

Table 1. Illinois Amphibians—Salamanders.

Family / Common Name	Scientific Name
Cryptobranchidae	
Hellbender	*Cryptobranchus alleganiensis*
Ambystomatidae	
Jefferson salamander	*Ambystoma jeffersonianum*
Blue-spotted salamander	*Ambystoma laterale*
Spotted salamander	*Ambystoma maculatum*
Marbled salamander	*Ambystoma opacum*
Silvery salamander	*Ambystoma platineum*
Mole salamander	*Ambystoma talpoideum*
Smallmouth salamander	*Ambystoma texanum*
Tiger salamander	*Ambystoma tigrinum*
Salamandridae	
Eastern newt	*Notophthalmus viridescens*
Plethodontidae	
Southern two-lined salamander	*Eurycea cirrigera*
Longtail salamander	*Eurycea longicauda*
Cave salamander	*Eurycea lucifuga*
Four-toed salamander	*Hemidactylium scutatum*
Redback salamander	*Plethodon cinereus*
Zigzag salamander	*Plethodon dorsalis*
Northern slimy salamander	*Plethodon glutinosus*
Dusky salamander	*Desmognathus fuscus*
Proteidae	
Common mudpuppy	*Necturus maculosus*
Sirenidae	
Lesser siren	*Siren intermedia*

Table 2. Illinois Amphibians—Frogs and Toads.

Family / Common Name	Scientific Name
Pelobatidae	
Eastern spadefoot toad	*Scaphiopus holbrookii*
Bufonidae	
American toad	*Bufo americanus*
Fowler's toad	*Bufo fowleri*
Hylidae	
Cricket frog	*Acris crepitans*
Spring peeper	*Pseudacris crucifer*
Upland chorus frog	*Pseudacris feriarum*
Western chorus frog	*Pseudacris triseriata*
Illinois chorus frog	*Pseudacris streckeri illinoensis*
Bird-voiced treefrog	*Hyla avivoca*
Green treefrog	*Hyla cinerea*
Cope's gray treefrog	*Hyla chrysoscelis*
Eastern gray treefrog	*Hyla versicolor*
Ranidae	
Crawfish frog	*Rana areolata*
Bullfrog	*Rana catesbeiana*
Green frog	*Rana clamitans*
Pickerel frog	*Rana palustris*
Northern leopard frog	*Rana pipiens*
Plains leopard frog	*Rana blairi*
Southern leopard frog	*Rana sphenocephala*
Wood frog	*Rana sylvatica*
Microhylidae	
Eastern narrowmouth toad	*Gastrophryne carolinensis*

fertilize the eggs as they are deposited by the female. Salamanders are mute and rely on reproductive pheromones to attract mates. Male salamanders deposit sperm in small gelatinous packets called spermatophores. These are laid on moist ground or the bottom of a pool, wetland, or pond. After courtship, females pick up these packets with their cloacas and the eggs are fertilized internally.

The eggs of all amphibians are enclosed within thin protective membranes and, in many species, masses of jelly-like material. Without these coverings, the embryos would be prone to desiccation and predation. All Illinois frogs and toads lay their eggs in water and the hatchlings develop into larvae called tadpoles, which feed primarily on algae and other plant material. Frogs and toads show no form of parental care beyond placement of eggs in suitable habitat. Most salamanders also lay their eggs in water but have predatory aquatic larvae that feed on insect larvae and other small invertebrates. Some salamanders have no larval stage but rather hatch as miniature versions of adults. In some species of salamanders, adults guard the eggs until they hatch.

After larvae transform into adults, a process called metamorphosis, young amphibians disperse into the surrounding habitat. Amphibians can be surprisingly long-lived with some frogs and toads known to live 10 years and some salamanders known to live 12 years in captivity.

Ecology and Reproduction

Illinois amphibians may be placed into five groups based on their ecology and reproduction:

Pond resident species reside in or along a pond border where they can be seen much of the year. All lay their eggs in the pond and have an aquatic larval stage. Included in this group are cricket frogs, bullfrogs, green frogs, pickerel frogs, green treefrogs, bird-voiced treefrogs, and newts.

The northern leopard frog (*Rana pipiens*), a pond resident. Photo by C.Phillips, Illinois Natural History Survey.

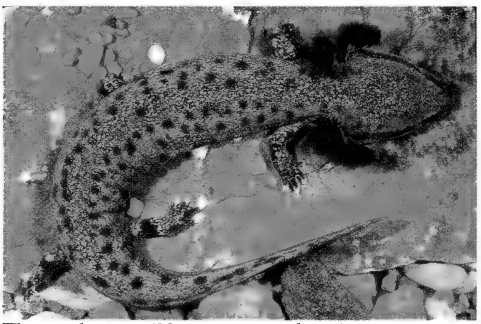
Pond migrant species spend much of the year on land and migrate to a pond during a short breeding period. Individuals show site fidelity by returning to the same breeding ponds year after year. Like pond resident species, egg-laying and larval

development occur in water. Included in this group are Jefferson, blue-spotted, spotted, marbled, silvery, mole, smallmouth, tiger, and four-toed salamanders, toads, spring peepers, chorus frogs, wood frogs, leopard frogs, eastern spadefoot toads, crawfish frogs, narrowmouth toads, and gray treefrogs.

The marbled salamander (*Ambystoma opacum*), a pond migrant. Photo by C.Phillips, Illinois Natural History Survey.

Streamside/ Spring salamanders live in or along streams or springs. Included in this group are dusky, two-lined, longtail, cave, and four-toed salamanders. Female dusky and four-toed salamanders lay eggs under cover along a streambank and guard developing embryos until they hatch. Female two-lined and long-tailed salamanders attach eggs to undersides of rocks in small streams and remain near them until they hatch. Female cave salamanders attach eggs to rocks in underground springs and cave streams.

The two-lined salamander (*Eurycea cirrigera*), a streamside/spring resident. Photo by C.Phillips, Illinois Natural History Survey.



The mudpuppy (*Necturus maculosus*), a permanently aquatic resident. Photo by M. Redmer.

Permanently aquatic salamanders spend their entire lives in water. Included in this group are

hellbenders, mudpuppies, adult newts, and lesser sirens. Male hellbenders and mudpuppies guard clusters of developing eggs until they hatch. In most newt populations, the larvae transform into a terrestrial form called an eft, which lives on land for several years before returning to water as an adult to breed.

Completely terrestrial salamanders of the genus *Plethodon* complete their life cycle without an aquatic larval stage. Eggs are laid in rotting logs or burrows on land and are guarded by the female until they hatch. Embryonic development is direct—the embryo hatches into a miniature version of the adult. Included in this group are the redback, zigzag, and slimy salamanders.

The redback salamander (*Plethodon cinereus*), a completely terrestrial amphibian. Photo by R.W. Van Devender.

AMPHIBIAN CONSERVATION

Illinois' Amphibian Diversity

Forty-one species of amphibians (20 salamanders and 21 frogs/toads) are known to occur in Illinois (Tables 1 and 2). Some are relatively common and nearly statewide in distribution. Some are known from a few localities and others only from highly specialized habitats such as sand prairies or

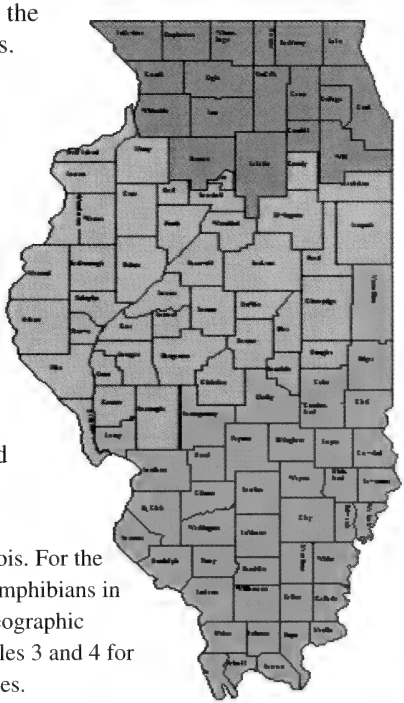


Figure 1. Map of Amphibian Zones in Illinois. For the recommendations given in this guide, the amphibians in Illinois can be grouped into three simple geographic zones—North, Central, and South. See Tables 3 and 4 for which amphibians reside in each of the zones.

Table 3. Distribution, nonbreeding, and breeding habitats of Illinois salamanders. (E) = endangered, (T) = threatened, (R) = rare (Notify IDNR if encountered). W = widespread, L = localized; * = fishless or refuge from predators.

SPECIES	NORTH ZONE	CENT. ZONE	SOUTH ZONE	NON-BREEDING HABITAT	BREEDING HABITAT
Jefferson salamander **(T)**	–	–	L (NE)	wooded	pool*
Blue-spotted salamander	L (E 1/3)	–	–	wooded	pool*
Spotted salamander	L	–	W	wooded	pool or wetland*
Marbled salamander	–	–	W	wooded	pool*
Silvery salamander **(E)**	–	–	L (NE)	wooded	pool*
Mole salamander **(R)**	–	–	L (S 1/3)	wooded	pool*
Smallmouth salamander	–	W	W	wooded & open	pool or wetland*
Tiger salamander	W	W	W	wooded & open	pool, wetland, or pond*
Hellbender **(E)**	–	–	L(SE)	aquatic	river
Dusky salamander **(E)**	–	–	L(S1/4)	wooded	stream bank
Southern two-lined salamander	L(E)	L(E)	L(E)	wooded	stream
Longtail salamander	–	L(SW)	L	wooded	stream or spring
Cave salamander	–	–	L (S 1/3)	wooded (near caves)	stream or spring
Four-toed salamander **(T)**	L	L	L	wooded	stream, pool, or wetland
Mudpuppy **(R)**	L	L	L	aquatic	river, lake, or pond
Central newt	W	L	W (S 1/2)	wooded & mixed	pool or wetland
Redback salamander	L(E)	L(E)	L(E)	wooded	forest floor
Zigzag salamander	–	–	L	wooded	forest floor
Northern slimy salamander	–	–	W	wooded	forest floor
Lesser siren	–	L	W	aquatic	wetland

Table 4. Distribution, nonbreeding, and breeding habitats of Illinois frogs and toads. (E) = endangered, (T) = threatened, (R) = rare (Notify IDNR if encountered). W = widespread, L = localized; * = fishless or refuge from predators.

SPECIES	NORTH ZONE	CENT. ZONE	SOUTH ZONE	NON-BREEDING HABITAT	BREEDING HABITAT
Blanchard's cricket frog	L	W	W	wooded & open	most aquatic habitats
American toad	W	W	W	wooded & open	most aquatic habitats
Fowler's toad	L	W	W	wooded & open	most aquatic habitats
Eastern narrowmouth toad **(R)**	-	-	L	wooded & open	pool or ditch*
Bird-voiced treefrog **(T)**	-	-	L(S1/4)	wooded	wetland
Cope's/Eastern gray treefrogs	W	W	W	wooded & open	pool, wetland, or pond*
Green treefrog	–	–	L(S1/4)	wooded & mixed	pool, wetland, or pond*
Spring peeper	W	W	W	wooded & mixed	pool or wetland*
Western/Upland chorus frogs	W	W	W	wooded & mixed	pool or wetland*
Illinois chorus frog **(T)**	-	L	L	open (sandy soil)	pool or wetland*
Crawfish frog	-	L	W	mixed & open	pond*
Plains leopard frog	L(SE1/4)	W	L(SW)	mixed & open	wetland or pond
Bullfrog	W	W	W	wooded & open	most aquatic habitats
Green frog	W	W	L(S)	wooded & mixed	most aquatic habitats
Pickerel frog	L	L	L	wooded (near caves)	most aquatic habitats
Northern leopard frog	W	L	-	wooded & open	wetland or pond
Southern leopard frog	-	W(S1/2)	W	wooded & open	most aquatic habitats
Wood frog	L	L	L	wooded	pool*
Eastern spadefoot toad **(R)**	–	–	L	wooded & mixed	pool or ditch*

baldcypress swamps. Three are listed as state-endangered and four as state-threatened. Amphibian habitats in Illinois have been greatly reduced in area and severely fragmented during the past 200 years through land development, drainage, habitat destruction, and pollution.

Conservation Concerns

The decline of amphibian populations locally, nationally, and worldwide has received widespread publicity in the media and generated significant public concern. Suggested causes, in addition to continued habitat loss, include acid rain, pathogenic fungi, increased ultraviolet radiation, and breakdown products of plastics and pesticides. Because few long-term monitoring programs provide information on amphibian populations, these causes are difficult to evaluate.

Increased reports of deformed amphibians also have sparked concern recently. Deformed frogs have been found throughout the United States and Canada. In Illinois, deformed frogs have been reported from 13 of 102 counties. Some agents thought to cause deformations are predator damage, parasites, increased exposure to ultraviolet radiation, and environmental contaminants.

Value of Amphibians

Amphibians are valuable indicators of water quality. Because of their thin skins and requirement to be in or near water, adult amphibians act as "sponges" for environmental contaminants. Eggs, larvae, and adults are directly exposed to pollutants in water. A decrease in amphibian numbers may be an early warning of a general decline in water quality which could be harmful to humans as well.

All adult amphibians are predators on a variety of invertebrates, primarily insects. Salamander larvae and aquatic adults eat large numbers of mosquito larvae. Toads are well-known pest controllers because of the large quantities of insects they consume. Before the widespread use of pesticides, toads and other amphibians consumed large numbers of insects in and around planted fields.

Ecologically, amphibians are links in many food chains. In healthy ecosystems, amphibians form part of the food supply for other animals such as predatory mammals, birds, and snakes. Frog legs are consumed by many humans.

Large numbers of frogs and salamanders are used in educational and biomedical research laboratories for dissection, experimentation, and as a source of eggs in developmental biology. Live displays of amphibians are common interpretive exhibits in many nature centers, zoos, and other environmental education efforts.

There is increasing public interest in "watchable wildlife" and in nature, generally. Many people experience satisfaction with their ability to identify animals encountered in the wild. Recognizing frog and toad calls, especially without actually seeing the adults, adds to this satisfaction.

AMPHIBIAN MANAGEMENT GUIDELINES

Determining Amphibian Needs

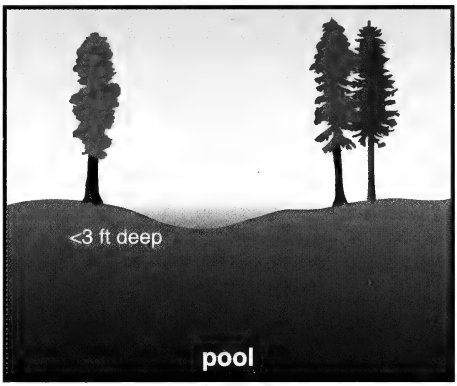
Research and field experience have demonstrated that the techniques described below benefit amphibians. Amphibians are fairly secretive animals and their presence may not be obvious. Additionally, it takes some time before they discover new habitats. Landowners should exercise patience and not be concerned if they do not immediately see more amphibians in their managed area. As time passes more species and individuals will use the site, increasing its conservation value over time.

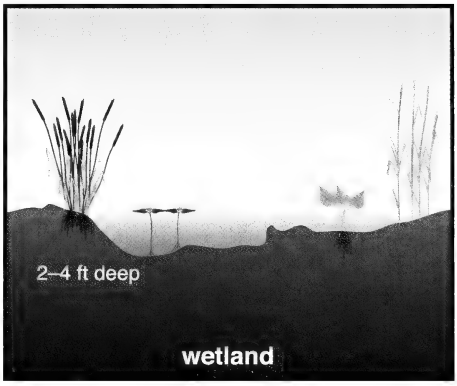
The most important part of developing a plan is to assess your property and the surrounding landscape to determine what amphibian habitats are already present, especially those in or near a pond or stream, and what additional habitats can or should be established. Using Figure 1 and Tables 3 and 4, determine the species most likely present in your immediate area and note the breeding and nonbreeding habitats of those species. These will be your "target" species and "target" habitats. Focus your efforts on protecting and managing all existing habitats and adding or supplementing those that are in short supply. An Illinois Department of Natural Resources (IDNR) Natural Heritage Biologist can assist with these determinations (see map on inside back cover).

Several species of amphibians are not well suited for management with local habitat creation or enhancement. Hellbenders, mudpuppies, sirens, four-toed, dusky, two-lined, longtail, and cave salamanders are best managed by protecting existing habitats and encouraging practices that improve water quality, stream health, and cave and spring ecosystems where they occur.

Creating Breeding Pools, Wetlands, and Ponds

The most critical habitat need for amphibians statewide are breeding sites that ensure successful reproduction. Though these animals are relatively long-lived, they will disappear if reproduction is poor or suitable breeding sites are not available. Many areas of Illinois lack suitable breeding sites. Efforts to construct new or manage existing pools, wetlands, and ponds are of great conservation value and should receive very high priority by all landowners.





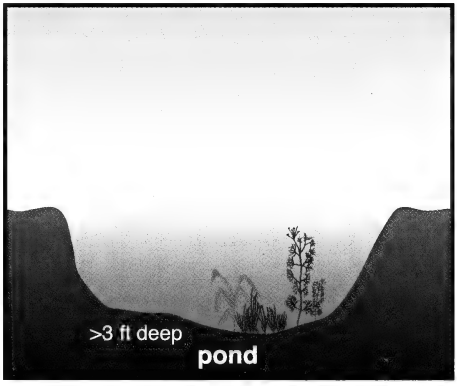


Figure 2. Photos and cross-view diagrams of pool, wetland, and pond as discussed on opposite page.

Pools (see Fig. 2 on opposite page) are very small bodies of water up to one-half acre or so. Pools have no or little aqautic vegetation, are generally less than three feet deep, and hold water for only a few months of the year, usually spring and summer. The bottoms of pools generally consist of dead plant material that falls into the basin (e.g. leaves, twigs). *Wetlands* are shallow waters, up to two to four feet deep, that support at least some aquatic vegetation, can range from one-quarter to several acres in size, and may hold water for the entire year or only part of the year. In terms of amphibian management, *ponds* are permanent bodies of water usually over three feet deep that may or may not support aquatic vegetation.

Landscape Location

For amphibians, one of the most important factors affecting the value of a breeding site is its location in the landscape. As Tables 3 and 4 indicate, amphibians can be found in a variety of habitats ranging from open grassland to closed forest. Therefore, amphibians can benefit from breeding sites constructed in or near almost any habitat. If your property has a variety of habitats, try to establish a breeding site in each or alternatively, create a somewhat larger pool, wetland, or pond adjacent to a forest-open field border. Sites in or near well-wooded areas or along forested streams or river corridors are especially attractive to amphibians.

The first rule to follow in deciding where to construct a new pool, wetland, or pond for amphibians is to make sure the existing habitat doesn't already have higher ecological value than the proposed one. For example, it is tempting to choose the wettest spot on your property for a new pond. This is an appropriate strategy if you have done a preliminary survey and have concluded that the site has little or no existing ecological value. However, these wet areas may already support amphibians and other wetland plants and animals and may or may not need further management. If in doubt about the current ecological value of your proposed pond site, request assistance from your local IDNR Natural Heritage Biologist (see map on inside back cover).

Another important factor to consider is the source of water. You might build an attractive wetland, but if the source water is polluted, it won't provide habitat for amphibians. Most pools, wetlands, and ponds will be fed by direct rainfall and surface runoff. There is nothing a landowner can do to control the quality and amount of rainwater. The quality and quantity of surface runoff, however, can be affected to some degree by the location of the pond and establishment of vegetative filter strips. If you plan to build your pond in a natural drainage (such as a ditch or intermittent stream), you can test water quality beforehand. If you enlarge a depression in a level area, you may be able to test water collected from a test pit dug prior to construction. Test pits can be as small as two feet deep and a foot wide. If

you suspect that pollutants such as heavy metals or pesticides may be present, contact the Illinois State Water Survey for advice on testing (217-333-9234).

You can also gain insight into how many months of the year a pond will hold water by observing a test pit for a few months. It is not necessary that a breeding site hold water all year. In fact, many amphibian species thrive in breeding sites that fill in early spring and are dry by August (see "Size and Depth"). This provides plenty of time for egg-laying and the transformation of aquatic larvae into land-dwelling adults. You can get a general estimate of this duration by observing or recalling your land under normal, drought, and flood years and by watching drainage in the immediate vicinity after a heavy rain or snow melt. Factors such as location relative to surface runoff and amount of rainfall also contribute to permanence. Personnel at your local U.S. Department of Agriculture, Natural Resource Conservation Service Center may be able to provide information on watershed size and amount of runoff that will be available to your site.

A third important factor is the absence of fish. Many fish species prey on adult amphibians or their eggs and young. Amphibian populations achieve their highest diversity and numbers in the absence of fish. Therefore, you should avoid digging your pond within the primary floodplain of a creek or river. Even a fairly small, intermittent stream that does not harbor fish during most of the year may receive fish during floods.

As in any construction project, be aware of the location of utility lines, septic lines, leach fields, tiles, access lanes, and property lines and easements.

Size and Depth

A successful breeding pool, wetland, or pond need not be large or hold water throughout the year. A few widespread species such as the American toad and western chorus frog require water for only three months (usually March, April, and May) of the year and, therefore, are most successful in ephemeral vernal pools that start holding water in late winter or spring. Species with longer breeding cycles will benefit from wetlands or ponds that hold water until August or September.

Suggested minimum dimensions for an ephemeral pool or wetland are 10 to 20 feet across and no more than 3 feet deep with gradually sloping sides. If possible, a variety of sizes can be constructed on a given area. Almost any shape is satisfactory. For a permanent pond, the depth should be increased to at least three feet, with very gradual side slopes to maintain an extensive area of shallow water. Most species of amphibians lay their eggs in shallow water and their larvae feed in shallow water. Small permanent amphibian ponds can be up to one-half acre or more. These

dimensions will not guarantee that your pond will hold water in all years but permanence is not important to most amphibians.

Many reconstructed wetlands and ponds have a water control structure that permits manipulation of water level. In the majority of cases, such structures are an unnecessary expense in small pools built primarily for amphibian conservation. As long as a pool holds water for at least three to six months of the year in all but drought years, amphibians use and benefit from these habitats. Occasionally, a water control structure may be required to protect a dam or other water retention structure, but is not required for amphibian management in pools.

In constructing wetlands and ponds for amphibian conservation, size and depth can be to the owner's preference. In both cases, large areas of shallow water must be made available for successful amphibian reproduction. In addition to information from IDNR resource biologists, several excellent resources for wetland and pond construction in Illinois are available (see "References").

Timing

The time of year you create breeding sites is not extremely important, but you should avoid wet periods when the ground is saturated. Dry soil will make excavation easier and allow you to achieve the desired slope and depth more accurately. It may be necessary to make adjustments to a new site, so do not be discouraged if your original design does not hold water as long as you would like or attract amphibians immediately. Your pond construction plan should be flexible enough to allow for modifications that seem necessary after initial construction and a one-year observation period.

Do not be discouraged if your pool, wetland, or pond does not attract amphibians in the first season; most amphibians have limited ability to disperse from nearby populations. The time it takes for amphibians to reach a newly constructed pond varies depending on the distance to the nearest aquatic habitat, the suitability of the intervening landscape, and the number of species that occur in your part of the state.

You should not introduce amphibians into your site, rather, wait for them to come on their own because most species are thought to be adapted to local environments. Moving animals even modest distances can disrupt this adaptation and result in their death. There is also the potential of introducing unwanted diseases or parasites. Moving individuals from their home environment to a new one can cause stress, which can lead to disease or death. Moving amphibians into a different area should be considered only after consultation with an IDNR Natural Heritage Biologist. Moving endangered or threatened species should be done only as part of an authorized recovery plan for the species.

Pond Liners

If your new pool or pond does not hold water, you may need to consider lining it with clay or bentonite. Plastic liners are not recommended because they prohibit access to the bottom sediments and prevent the establishment of aquatic vegetation. Some amphibians and many insects overwinter in the sediments at the bottoms of pools, wetlands, and ponds. The thin layer of sediment that accumulates over plastic liners is not deep enough to provide a secure overwintering environment.

Managing Pools, Wetlands, and Ponds

In addition to newly constructed sites, many existing pools, wetlands, and ponds, whether natural or artificial, can provide excellent amphibian habitat. Natural habitats such as wetlands and floodplain ponds likely already support amphibians, so do not rush to manipulate them. Management efforts should be directed towards protection of the existing breeding sites and watersheds as well as provision of other habitat components beneficial to amphibians.

Examples of artificial but potential amphibian breeding areas include livestock ponds, silted impoundments, old ponds with collapsed dams that still hold some water, borrow sites, and even heavy equipment ruts if they hold water during spring through summer. Basically, any depression that holds water from at least March through June or later is potential amphibian breeding habitat.

Whether you develop an amphibian breeding site from scratch or manage an existing one, several factors are important in attracting and maintaining populations of frogs, toads, and salamanders. The area must provide breeding habitat as well as food and cover for larval and adult amphibians. Three factors are most critical: refuge from predators, extensive shallow water areas (less than three feet deep), and abundant cover.

Refuge from Predators

Current research indicates that predators, especially fish, can eliminate amphibians from a pond by eating eggs, larvae, and adults. Some amphibians, such as toads and bullfrogs, have defenses such as distasteful or noxious skin secretions that deter predators. Many amphibian species, however, do not possess these defenses. Pools, wetlands, and ponds for amphibian conservation should be separate from those managed for fish. Permanent ponds with fish can provide some benefit to amphibians if abundant shallow water and vegetative cover are provided.

Amphibian management can be very effective in small (less than two acres), shallow (less than three feet), weedy ponds where sport fishery

management is not desirable or feasible. Frogs, toads, and salamanders will use larger or deeper ponds if fish are absent and other habitat components are present.

Fish should not be introduced into ponds constructed for amphibian conservation. In existing ponds, fish removal can be accomplished by either draining the pond in late fall or winter or applying rotenone to the pond. *Rotenone is a neurotoxin that interferes with oxygen uptake, especially through gills. Fish and larval amphibians are very sensitive to rotenone. Therefore, any attempt at fish removal should occur after aquatic amphibian larvae have transformed into adults, typically fall through early winter.* A DNR Fisheries Biologist can provide required permits and technical information on amounts and methods of application. We do not recommend fish removal *of any kind* from ponds subjected to regular flooding from adjacent streams or rivers.

Shallow Water

As noted earlier, most amphibian egg laying and larval development takes place in water less than three feet deep. Habitat can be improved in artificial ponds by providing large expanses of shallow water with a shallow slope (>5:1) from the shoreline. If shallow areas are not present or are rare, taper areas with hand tools or equipment as needed. Extensive shallow water can provide some amphibian habitat in ponds containing fish and should be a primary focus on lands where separate amphibian breeding pools, wetlands, or ponds cannot be created or restored.

In general, we do not recommend recontouring natural ponds or wetlands. Sufficient shallow water areas probably exist and modification might be necessary only in the rare cases where human disturbance has resulted in habitat degradation. A U.S. Army Corps of Engineers permit may be required for such work.

Aquatic Cover

Breeding sites in woodland areas provide different cover habitat than those in open areas. Ponds shaded by trees and/or shrubs have bottoms covered with leaf litter, fallen branches, and downed logs. These are critical habitat components (egg attachment sites, perches, feeding areas, protective cover) and should not be removed. If they have been removed or are not present, they can be added at a rate of 1 or more branches or downed logs for every 50 square feet. There is no specific optimal amount; too much is better than not enough. If it is not already present, leaf litter, but not lawn clippings, can be collected and spread over the bottom in fall or winter.

Aquatic cover in open areas is primarily aquatic vegetation, both emergent (parts of the plant above the water surface) and submergent (the entire plant below the water surface). Many plants can naturally establish in

wetlands and open pools and ponds; therefore, planting may not be necessary. Vegetation is frequently absent from old stock ponds, however. Aquatic plants can be planted either from locally collected seed or rootcuttings, or purchased from nurseries specializing in wetland plants (Appendix 1). A landowner's permission is necessary for collecting seeds or rootcuttings. Table 5 lists some widespread native species that are appropriate for use in and around amphibian ponds. Plant species not native to Illinois and horticultural varieties should be avoided. There is no concern about having too many aquatic plants for amphibians. The establishment of a densely vegetated shallow water area in a fish pond provides the best opportunity in this pond type for amphibian conservation. The larger the area that can be established, the better.

In either woodland or open areas, shorelines can be enhanced by adding downed logs as cover and basking sites. Flat rocks can also be used to provide cover on shorelines. The use of treated lumber and construction waste is not recommended, nor should standing dead trees in or near the site be cut down for cover. These snags provide habitat for amphibians such as gray treefrogs as well as numerous birds and mammals. Relocating already downed trees or logs from outside the area is preferred.

Managing Adjacent Habitat

Habitats adjacent to breeding sites can be open, wooded, mixed, or aquatic. Open refers to grasslands, pastures, fallow fields, or other lands that are predominantly free of trees. Wooded refers to forests, tree plantations, or other lands that have a predominantly closed tree canopy, leaf litter on the ground, and minimal grass cover. Mixed refers to a combination of open and wooded and includes sparsely wooded pastures, orchards, savannas, and glades. Aquatic refers to streams and other nearby pools, wetlands, and ponds.

Watershed Protection and Terrestrial Habitat

Watershed protection is important in maintaining water quality and preventing the accidental introduction of pesticides or pollution from nearby lands. Vegetated buffer strips at least 100 feet wide can reduce pollution from offsite. It is desirable that your breeding sites be surrounded by 100 feet or more of permanent vegetative cover. Consider planting grasses and flowering plants to create this buffer zone, if necessary. For breeding sites in or near wooded areas, native trees and shrubs should be planted as well.

Permanent vegetated corridors between breeding sites and any nearby aquatic habitats, such as wetlands, streambanks, and floodplains, should be established where they are lacking. Corridors act as refuges for adult and dispersing juvenile amphibians and permit movement between aquatic

Table 5. Some native Illinois aquatic plants for use in amphibian ponds.

EMERGENTS	
Herbaceous Plants	
Arrowhead	*Saggitaria brevirostra*
	Saggitaria latifolia
Pickerelweed	*Pontederia cordata*
Spikerush	*Eleocharis obtusa*
	Eleocharis palustris
Wild celery	*Vallisneria americana*
Pond lily	*Nuphar luteum*
Lizard's tail	*Saururus cernuus*
Bullrush	*Scirpus validus*
	Scirpus acutus
Water lily	*Nymphaea tuberosa*
Shrubs	
Red osier dogwood	*Cornus stolonifera*
Silky dogwood	*Cornus obliqua (amomum)*
Buttonbush	*Cephalanthus occidentalis*
SUBMERGENTS	
Naiad	*Najas sp.*
Coontail	*Ceratophyllum sp.*
Pondweed	*Potamogeton foliosus*
	Potamogeton nodosus
	Potamogeton pectinatus
	Potamogeton zosteriformis

habitats. In primarily open areas, native grasses and wildflowers can be planted. In or along wooded areas, native trees and shrubs should also be planted.

Terrestrial Cover

It is beneficial to leave logs, leaf litter, rocks, and other natural cover in place. A neat, clean piece of ground is not good amphibian habitat. Fallen logs and leaf litter are important to amphibians in woodlands and should be allowed to accumulate, particularly around breeding sites. As logs and litter decompose, they maintain a level of moisture that is required by amphibians.

Ground cover is particularly important to the early survival of young amphibians. Habitat adjacent to breeding sites can be enhanced by providing additional cover in the form of rocks, brush, and logs. These are particularly effective within the buffer zones around the edges of breeding sites, because they provide moist hiding places for newly transformed amphibians when they first leave the pond.

Mowing and Haying

An unmowed area at least 100 feet wide should be left around the shoreline and/or streambanks. If mowing is unavoidable, it should be done as infrequently as possible and during the warmest part of the day, usually early to mid-afternoon, when most amphibians are not active on the surface. This will greatly reduce mortality of frogs, toads, and salamanders and their food organisms.

Prescribed Burning

Prescribed burning is a common management tool for maintaining some wooded areas, as well as savannas and grasslands. At first glance, burning may seem contradictory to amphibian conservation. However, some species may depend on habitats that require periodic prescribed burns and, therefore, may benefit from this activity.

Several precautions should be taken to minimize adverse impacts to amphibians. Burning can be performed at times of the year when amphibians are least likely to be exposed. Dormant season (fall or winter) burns can be appropriate as can burning when the moist habitats amphibians inhabit provide protection from fire. Actual times of the year for such burns depend more on seasonal progression and your location in Illinois than on calendar dates. Strive to conduct burning at a time when conditions are right and not on a particular week or month. Consult your local IDNR Natural Heritage Biologist for information on your location.

Leave some areas unburned as refuges and do not try to re-ignite unburned patches. Creating a mosaic of burned and unburned areas allows for vegetation management and plant litter to provide cover, especially near aquatic habitats.

Grazing

Livestock may be detrimental to amphibians, particularly in and around breeding ponds and small streams, but they can co-exist if livestock are partially excluded from aquatic habitat such as stock ponds. Partial exclusion can be achieved by fencing, including temporary electrical fencing, during the spring and summer months. If necessary, pond water may be used to supply a stock tank, keeping livestock away from the pond itself.

Grazing stock can increase erosion and siltation, trample and reduce pond and stream-bank habitat, and reduce water quality. Livestock ponds and streams with bare banks seldom support populations of amphibians. Maintaining a well-vegetated shoreline by limiting stock access to certain times of the year or a certain number of animals, in short, implementing best grazing practices, can protect water quality, habitat conditions, and forage quality.

Pesticides

Pesticide use over or near water can harm amphibian populations in several ways. Because water passes freely through the amphibian skin, frogs, toads, and salamanders will be exposed to and can be affected by any chemicals in the water. Broadscale application of herbicides or insecticides aerially or with boom sprayers near amphibian breeding sites can be particularly harmful. Many pesticides are not labeled for use in or near aquatic habitats.

If herbicide use cannot be avoided, spot treatments with products such as glyphosate, which usually breaks down rapidly, are preferred. Follow label instructions and pay particular attention to herbicide drift. Herbicides that are labeled *moderately* or *highly toxic* or that take a long time to break down can be detrimental to amphibians and should be avoided near water and adjacent habitat.

Use of insecticides near amphibian habitats is not recommended. Insects and other invertebrates are important as amphibian food. Insecticide-killed or -injured prey can lead to high levels of these compounds in their predators. Residues of some pesticides are known to interfere with amphibian reproductive cycles by mimicking reproductive hormones. Frequently expressed concerns regarding increased mosquito problems near amphibian breeding sites are often overemphasized. A well-balanced aquatic community supports many predators of mosquito larvae, including amphibians, and will result in little, if any, noticeable increase in these insects.

OTHER RECOMMENDATIONS AND SUGGESTIONS

Record Keeping

To add to your enjoyment of the amphibians that use your land, you may wish to keep a record of the species you observe. This can be as simple as listening for frogs and toads from a comfortable seat on your patio or deck. If you prefer, you can take a more formal approach and collect information that will contribute to the scientific understanding of the species in your

area. With a little practice, frogs and toads can be identified by their calls. Males of each species make distinctive sounds that will reveal their identity even if you cannot see the animals. Tapes of frog and toad calls are available to help you learn how to identify the species in your pond. Some of these learning aids are listed in the "Additional Materials" section of this booklet.

In addition to identifying the frogs and toads that are attracted to your pond, you may wish to record the dates on which various species are heard. Of particular interest are the earliest and latest dates on which a species is heard each year. Other useful information includes the air and water temperatures and the amount of precipitation during or just before calling occurs. You may also want to inspect your pond and record the dates on which eggs, tadpoles and/or salamander larvae, and newly transformed amphibians are seen. An example data sheet is provided in Appendix 2.

Reporting Endangered Species

Depending on where you live, you may be lucky enough to attract one of Illinois' endangered or threatened species to your pond. Their presence should be reported to the Illinois Department of Natural Resources. Precise information on the distribution and abundance of these species is needed to keep the endangered species list up to date and accurate. The map on the inside back cover will show you which office to contact to report endangered species. Ask for the IDNR Natural Heritage Biologist whose district includes the county in which you live. Information on the location of endangered species is not shared with the public, so you need not be concerned that reports will lead to trespass problems on your property.

Reporting Deformed Amphibians

There has been an increase in reports of deformed amphibians, particularly frogs, in the past several years. If you find amphibians with physical deformities, please record details on the species, location, type of deformity, how many normal animals were seen with them, how many deformed animals, and the habitat. If possible, photograph the deformed animal. This information should be reported to the North American Reporting Center for Amphibian Malformations (NARCAM), a program of the Biological Resources Division of the U.S. Geological Survey. Reports can be filed by phone at (800)238-9801 or through the Internet at http://www.npwrc.usgs.gov/narcam/. This Web site also includes general information on the problem of amphibian malformations.

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Additional Materials

Learning frog and toad calls:
Missouri Department of Conservation provides a cassette tape of 20 species native to Missouri and a color poster for $7. Available from: Missouri DOC, P. O. Box 180, Jefferson City, MO. 65102-0180

Cornell Laboratory of Ornithology. *Voices of the Night.* Recording of the calls of all frogs and toads of the eastern United States. Available from Cornell Lab Birding Shop, c/o Duncraft Service Center, 102 Fisherville Road, Concord, NH 03303-2086. Cost $15.95 for CD, $12.95 for casette. (Also available on-line).

Information on recording and tracking amphibian use of your site
FROGWATCH USA Web site: http://www.mp2-pwrc.usgs.gov/frogwatch/

Reporting deformed amphibians
North American Reporting Center for Amphibian Malformations. 800-238-9801, http://www.npwrc.usgs.gov/narcam/

Pond construction and management
Ponds—Planning, Design, and Construction. USDA, Natural Resource and Conservation Service, Agricultural Handbook #590. 84 pp. Check with your county NRCS office.

Illinois Wetland Restoration and Creation Guide. Illinois Natural History Survey Special Publication 19. 188+ pp. Available from Illinois Natural History Survey Publications Unit, 607 E. Peabody Drive, Champaign, IL 61820. Cost $15.

Amphibian and reptile educational materials
Illinois Department of Natural Resources. 1997. Illinois frog and toad poster. Contact IDNR, Division of Education, 524 S. Second St., Springfield, IL 62701; 217-524-9505, http://www.dnr.state.il.us/

Phillips, C.A., R.A. Brandon, and E.O. Moll. 1999. *Field Guide to Amphibians and Reptiles of Illinois.* Illinois Natural History Survey Manual 8. 282 pp. Available from Illinois Natural History Survey Publications Unit, 607 E. Peabody Drive, Champaign, IL 61820. Cost: $19.95.

Useful Web sites
NRCS Wetland Science Institute—http://www.pwrc.usgs.gov/wli/

Ducks Unlimited Wetland Engineering Manual—http://www.sedlab.olemiss.edu/projects/rodrigue/duwetlandengmanual.pdf

Link to Indiana NRCS—http://www.in.nrcs.usda.gov/PlanningandTechnology/Biology/biology.htm

Appendix 1: Nursery Listing

This listing does not constitute endorsement of or guarantee the quality of the product or services of the nurseries.

Several wetland plant nurseries are listed in *Illinois Wetland Restoration and Creation Guide*. Illinois Natural History Survey Special Publication 19. 188+ pp.

Also,

J.F. New Native Plant Nursery, 128 Sunset Drive, Walkerton, IN, 46574, 219-586-2412

Marshland Transplant and Aquatic Nursery, P. O. Box 1, Berlin, WI, 54923, 414-361-4200

Appendix 2: Amphibian Observations Data Sheet

AMPHIBIAN OBSERVATIONS

Pond Name ______________ Location ______________

County ______________ State ______ Observers ______________

Date	Time	Air Temp.	Water Temp.	Species				
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
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					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐
					calling ☐	adults ☐	eggs ☐	tadpoles or larvae ☐

Notes

Notes

ILLINOIS DEPARTMENT OF NATURAL RESOURCES
NATURAL HERITAGE DISTRICTS
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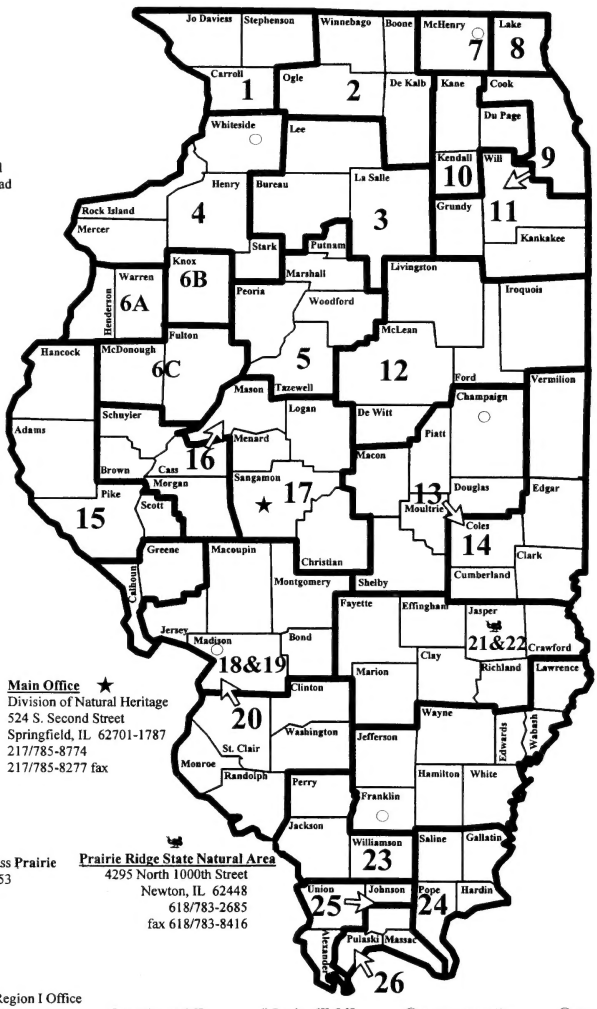

Main Office ★
Division of Natural Heritage
524 S. Second Street
Springfield, IL 62701-1787
217/785-8774
217/785-8277 fax

Prairie Ridge State Natural Area
4295 North 1000th Street
Newton, IL 62448
618/783-2685
fax 618/783-8416

District 1
Dearborn Hall
205 E. Seminary Street
Mt. Carroll, IL 61053
815/244-3655
815/244-1098 fax

District 2
Castle Rock State Park
1365 West Castle Road
Oregon, IL 61061
815/732-6185
815/732-6742 fax

District 3 & 6B
IVCC E. Campus Bldg. 11
815 N. Orlando Smith Road
Oglesby, IL 61348-9691
815/224-8219
815/224-8317 fax

Districts 4 & 6A
116 North East Street
PO Box 23
Cambridge, IL 61238
309/937-3384
309/937-3399 fax

District 5 & 6C
215 North 5th, Suite D
Pekin, IL 61554
309/347-5119
309/347-9037 fax

District 7
110 James Road
Spring Grove, IL 60081
815/675-2385
815/675-2495 fax

District 8
110 James Road
Spring Grove, IL 60081
815/675-2385
815/675-2495 fax

District 9
Vacant

District 10
Silver Springs State Park
13608 Fox Road
Yorkville, IL 60560
630/553-1372
630/553-9164 fax

District 11
Midewin National Tallgrass Prairie
30071 South State Route 53
PO Box 88
Wilmington, IL 60481
815/423-6370
815/423-6376 fax

District 12
Vacant

District 13
1660 West Polk Ave.
Charleston, IL 61920
217/345-2420
217/348-5873 fax

District 14
1660 West Polk Avenue
Charleston, IL 61920
217/345-2420
fax 217/348-5873

District 15
Route 106 West
Pittsfield, IL 62363
217/285-2221
fax 217/285-2750

District 16
700 South 10th Street
Havana, IL 62644
309/543-3262
fax 309/543-2989

District 17
Sangchris Lake State Park
9898 Cascade Road
Rochester, IL 62563
217/498-8534
fax 217/498-8476

Districts 18&19
4521 Alton Commerce Parkway
Alton, IL 62002
618/462-1181
fax 618/462-2424

District 20
Vacant
Horseshoe Lake State Park
3321 Highway 111
Granite City, IL 62040
618/931-6251
fax 618/931-8745

Districts 21&22
4295 North 1000th Street
Newton, IL 62448
618/783-2685
fax 618/783-8416

District 23
9053 Route 148, Suite B
Marion, IL 62959
618/993-7023
fax 618/993-7096

District 24
Vacant
Dixon Springs State Park
R.R. 2
Golconda, IL 62938
618/949-3305
fax 618/949-3795

District 25
Ferne Clyffe State Park
PO Box 67
Goreville, IL 62939
618/995-2568
fax 618/995-9330

District 26
0139 Rustic Campus Drive
Ullin, IL 62992
618/634-2545
fax 618/634-9656

○ Region I Office
Districts 1-6
2317 E. Lincolnway
Suite A
Sterling, IL 61081
815/625-2968
815/625-0706 fax

○ Region II Office
Districts 7-11
110 James Road
Spring Grove, IL 60081
815/675-2385
815/675-2495 fax

○ Region III Office
Districts 12-14
2005 Round Barn Rd.
Champaign, IL 61821
217/278-5773
217/278-5763 fax

○ Region IV Office
Districts 15-20
4521 Alton Comm Pkwy
Alton, IL 62002
618/462-1181
618/462-2424 fax

○ Region V Office
Districts 21-26
11731 State Highway 37
Benton, IL 62812
618/435-8138
618/439-7376 fax

Illinois Natural History Survey
607 East Peabody Drive
Champaign, IL 61820